

4. Green design

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4.1. Introduction

Green Design is a broad term that can be applied in many different contexts and refers to a variety of phenomena within contemporary product production. More specifically green product design can be also labelled as design for eco-efficiency, design for environment (DfE) or sustainable product design. The most general definition of green design describes it as a production model that integrates environmental protection criteria into every phase of product development – from conception to recycling – and makes optimal use of resources and energy. It has been argued however, that green design as ecologically sustainable design should be used together with economically sustainable design and socially sustainable design, so it takes into account a larger system. In a narrow sense green design is often associated with green architecture, so it might be better to use Ecological Design as a more suitable term in a broader context of product design.

4.2. History

Ecologically conscious resource management and design practices have been employed for centuries by local cultures around the globe. However the term ecological design was first used in a 1996 book by Sim van der Ryn and Stewart Cowan in which they defined it as seamless integration of human activities with natural processes to minimize destructive environmental impact [1]. Their arguments were followed in 2002 by the milestone book by William McDonough and Michael Braungart entitled ‘From Cradle to Cradle’, which proposed a circular economy model to replace the traditional linear one of ‘cradle to grave’ [2].

Read more – R1 in Extra Readings

4.3. Related terms

Social design: Focused on the needs of various groups of recipients, on defining and solving real problems. Formal and aesthetic concerns are secondary to the functionality and social impact of these projects. The initiator and advocate of such an approach was Victor Papanek in his

seminal book ‘Design for the Real World: Human Ecology and Social Change’ (1971) [3].

Critical design: This term was introduced by Anthony Dunne in his book ‘Hertzian Tales’ (1999), describing an attitude toward design or a philosophical mindset rather than a method. It reminds of other practices like Radical Design in Italy and avant-garde British architecture of the late 1960s – 1970s that have regarded design as a way to challenge the status quo, and to make viewers/users to consider the possible consequences of present choices and taken for granted solutions [4].

Read more – R2 in Extra Readings

4.4. Green Design Strategies

– **Biomimicry:** (biomimetic design) looking for nature and natural systems for inspiration; emulating best biological ideas and solutions to improve design,

Read more – R3 in Extra Readings

– **Dematerialization:** reducing the overall size, weight and number of materials incorporated into a design in order to reduce costs of transportation, reduce waste and improve product’s longevity;

– **Design for disassembly:** designing products that can be easily taken apart for recycling, repair or remanufacturing. Designers should carefully examine types of materials that are used and the connection methods;

– **Influence:** all objects in our surroundings have impact on our behaviour and further consumer choices – they in turn ‘design us’. Designers carry the responsibility for creating products, services, and systems that influence society in more positive ways. (see also: critical design, speculative design);

– **Longevity:** products should be aesthetically timeless (immune to seasonal trends), durable, made with quality materials and will retain their value over time so people can pass them on or resell;

– **Modularity:** products consisting of modules, separate but complementary pieces, that can be reconfigured in various ways to adapt to different spaces and individual needs. Modularity increase recycling and repairability by offering replacement parts;

- **Product Service Systems (PSS) Models:** business models and tactics, offering alternatives to purchasable products. Leasing a product out, rather than selling it, allows the company to manage the product across its life cycle, so it can be designed to fit back into a pre-designed recycling or re-manufacture system;
- **Product stewardship and extended producer responsibility:** a take-back program, when the producers offer to take back, repair, remanufacture or recycle the products. This motivates them to design products to be easily fixed, upgraded or disassembled for high-value material recycling;
- **Recyclability:** product designed in such way that they are likely to be recaptured and recycled;
- **Repairability:** this is the key aspect in the circular economy. Things wear out and break, so need to be designed to allow for easy, preferably diy repair;
- **Reusability:** designing so that the product can be reused in a different way from its intended original purpose, re-made to gain new function and to follow changing consumer's needs, without much extra material or energy inputs;
- **Re-manufacture:** designing to ease refurbishing: renovating and reassembling product's components to manufacture a new product;
- **Systems Change:** designing interventions that can shift the status quo of an unsustainable or inequitable system by changing its particular elements or procedures [5].

4.5. Waste prevention strategies in product design

A comprehensive design strategy is needed for preventing the generation of waste.

- use materials that minimize waste and are nontoxic and biodegradable;
- design for easy separation of different materials so they can be reused or recycled;
- zero waste approach in product design.

Read more - R5 in Extra Readings

4.6. Zero waste in fashion design and clothing production

Zero waste refers to various waste reduction activities, both by producers, designers and consumers, undertaken in order to care for the environment and responsible use of raw materials. One of the first people to apply this method was chemist Paul Palmer, founder of Zero Waste Systems Inc. The first comprehensive book on zero-waste fashion design was written by Timo Rissanen and Holly McQuillan [6] in 2018 (Zero Waste Fashion Design).

Problem: Textile waste in clothing production

- waste in the clothing production process accounts 10 – 30 [%] of the textile material [7].

Solutions:

- CAD system in ‘zero waste’ resolution (e.g. Assyst, Gerber, InvenTex, Lectra, Optitex);
- automatic layout of clothing patterns;
- clothing visualization on avatar without production;
- production of seamless clothing on a knitting machine (e.g. Shima Seiki);
- use the textile waste in other textile production (e.g. carpet, other cloths).

Recycling in fashion design

Use of recycled textiles – obtained from textile waste:

- Mechanical recovery of fibers from old textiles [8];
- Reclaiming raw materials from waste (e.g. plastic bottle PET [9]);
- Project from bottle raw materials – fashion designers: Iris von Herpen [10];
- In Research: chemical recycling of cotton fibers [9].

Production of clothing that can be recycled:

- In Research: life cycle assessment, LCA of textiles and cloth, e.g. 100% PET, 100% cotton and nearly 100% wool [11];
- Some clothing brands offer the option of leaving designer clothes for recycling [12];
- Problem with raw material mixtures e.g. cotton+ Elastane – only for downcycling for insulation [9].

Patchwork in fashion design:

- Definition: Patchwork – sewing together many smaller pieces of textile materials (often with simple geometric shapes) to create a new design [13];

- Historical genesis:
 - patchwork in Egyptian clothing and walls around 980 BC [13];
 - Chinese patchwork, from the Liu Song dynasty (420–479) [14];
 - Japanese patchwork, 19th and 20th century, boro – from cotton fabric dying by indigo [15];
 - patchwork fashion the 1960s [16];
- Fashion designers using patchwork, e.g.:
 - hippie style dress made with patchwork technique of patterned and multicolored triangles from 1969 Yves Saint Laurent [ill.1];
 - fashion collection from 2018, designed by Daniel Silvestein [ill.2], made from scraps from the production of his previous collections.

Pattern ‘zero waste’ – use of the entire surface of the fabric:

- Historical no-waste solutions where the entire garment drapping on to the body from a single piece of fabric: Greek Chiton [ill.3], Roman Toga [ill.4], Indian Sari [ill.5], Japanese kimono [ill.6];
- Fashion designers projects without waste, e.g.:
 - ‘A-POC’ collection from 1997 designed by Issey Miyake [ill.7] – items of clothing cut from one piece of fabric;
 - ‘Kimono doorway’ capsule collection from 2015 designed by Elena Ryleeva [ill.8] – straight-line-cut and elements refers to Japanese kimono;
- Problems: different width of the textiles, different selvages in textiles e.g. glue in knit or hole in fabric, problem with errors in textiles e.g. holes, textile structure compaction [17].

Check *GreenTEX Handout – Designer’s checklist*
 (<https://greentex.p.lodz.pl/>)

Extra readings

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List of illustrations

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